



MODEL BCT-3010

**LOAD BANK (DC RESISTIVE)
PART NUMBER K492D22642
150A @ 24/48 VDC**

Serial Numbers 54 and Above



N56 W16665 RIDGEWOOD DRIVE
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PROPRIETARY NOTE

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WARRANTY

The last page of this document contains an express limited warranty. The provisions of this warranty cover any and all rights extended to holders of Avtron equipment.



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APPENDIX - Avtron Load Bank Troubleshooting Guide

DRAWINGS

SB2111	Load Bank, Model K492 (Outline Drawing)
B21720	Schematic/Interconnection, Load Bank
K492D22642	Load Bank

LOAD BANK (DC RESISTIVE)

Part Number K492D22642

SECTION I

SAFETY CONSIDERATIONS

Throughout this manual, you will find **WARNING** and **CAUTION** statements. Personal injury to an operator using or repairing the equipment may occur if the **WARNING** statement is ignored. Damage to the equipment and potentially hazardous conditions for personnel may occur if the **CAUTION** statement is ignored.

Each Avtron unit is safety checked for opens and shorts, and the insulation is high potential tested to insure safe operation. All safety devices have been proven reliable as part of the testing procedure of each unit.

As part of your safety program, an initial inspection after receiving the unit(s) and periodic preventive maintenance and safety inspections should be conducted to insure the reliability and safety built into your Avtron equipment.

The Model K492 Load Bank is an industrial test unit designed to be used indoors. However, because the nature of the Load Bank function is the dissipation of electrical energy, there are inherent dangers to the operator and to the equipment. These dangers shall be outlined in this section.

Electrical energy is transformed into heat by the resistor elements. The heat is removed from the Load Bank by airflow through the resistor elements. If there are any restrictions or stoppage of airflow, the Load Bank may overheat and may even start a fire. The following recommendations are made:

1. Read the manual before operating the Load Bank.
2. Run an approved ground wire from the Load Bank ground terminal (GND), located on the lower right side of the control panel, to the power supply under test. Run an approved ground wire from the supply under test frame to a good earth ground. Size ground wire in accordance with National Electrical Code and any local codes.

3. Do not bypass OVER TEMPERATURE SAFETY switches to prevent nuisance tripping. The switches will drop out the load if insufficient cooling air is reaching the elements.
4. The Load Bank is not internally protected from short circuit faults or overcurrent applications. Therefore, it is recommended that the power supply being tested contain a fuse or that an external fuse be added between the power supply and the Load Bank input terminals.
5. Replace the light on the control panel if it is burned out. The light serves as an indicator that the Load Bank is overheating or that reverse polarity is connected at input terminals. This is important to the operation of the unit and the safety of the operator.

W A R N I N G

Personal injury from electrical shock may result if power is not disconnected before servicing. Maintenance work must be done only by qualified personnel.

6. Maintenance should be performed with no power on the unit. The majority of troubleshooting can be performed with an ohmmeter.
7. Venting the heated air from the exhaust toward overhead cables, sprinkler systems, or into a room with insufficient volume or make-up air, is a potential hazard. The Load Bank should be used in a cool, well-ventilated area.
8. Allow cool room air to pass into the unit to cool the elements. Do not allow the unit to be placed where hot exhaust air can recirculate back through the unit causing a constant rise in cooling air temperature.
9. After running a load test, residual heat may be removed from the Load Bank by allowing the blower to operate for a few minutes after loads are removed. This procedure is not required for Load Bank integrity but it may guard operating personnel from possible burn injuries.

10. The operator should avoid coming in contact with the resistor elements or surrounding covers during and for some time after operation. These portions of the Load Bank become quite hot and may result in a serious burn should contact be made with them.
11. Do not allow objects to enter or block the air intake or exhaust of the Load Bank. A blockage would cause Load Bank overheating. If an object enters the screens, it will cause damage to the resistor elements, possibly shorting them and causing shock and fire hazards.
12. Emergency Shutdown Procedure:

In an emergency, disconnect the load using the MASTER LOAD switch; then deactivate the power source under test.

The MASTER LOAD ON/OFF switch will disconnect both the load steps and the fans.
13. An approved electrical fire extinguisher should be on hand at all times.
14. It is the responsibility of the customer to take diligent care in operating the Load Bank. The National Electrical Code (NEC), sound local electrical and safety codes, and the Occupational Safety and Health Act (OSHA) should be followed when installing the equipment to reduce hazards to persons and property.
15. Observe proper polarity when connecting the Load Bank to the generator. If the Load Bank is not connected properly, the fans will not operate, the over temperature light will illuminate, and the Load Bank may be damaged when it is energized.
16. The Load Bank should never be left unattended while it is operating.
17. Read and heed all **WARNING** and **CAUTION** statements in the manual.

SECTION II

DESCRIPTION

The Model K492 Load Bank is an indoor, portable, self-contained unit for electrically loading and testing 24/48 VDC power supplies. The load bank is designed for production line and job site use.

The loading capability at 24/48 VDC consists of twelve steps for a total of 150 Amps. They are; 1, 2, 2, 5, 10, 10, 20, 20, 20, 20, 20, 20 Amps.

C A U T I O N

DO NOT operate the Load Bank over the rated voltage as this will cause a catastrophic failure in the Load Bank.

CONTROL PANEL

Load application is controlled from the integral mounted control panel at the front of the Load Bank. Controls and indicators are located on the Load Bank control panel as follows.

1. The MASTER LOAD ON/OFF switch controls power to the unit, power to load steps, and fan power.
2. The OVER TEMPERATURE indicator lamp lights if the Load Bank overheats or if reverse polarity is connected at input terminals. This lamp lights momentarily when power is turned on, but goes off when the safety circuit is cleared.
3. The load step ON/OFF switches are used to apply or remove load steps at the ratings listed under each switch.
4. The voltmeter and ammeter monitor the load applied. The voltmeter range is 0-60 volts DC $\pm 2\%$. The ammeter is 0-200 Amps $\pm 2\%$.

ENCLOSURE

The Load Bank is shown on Outline Drawing SB2111 and is 10.75 inches high, 18 inches deep, and 10.5 inches wide. The screened air intake is located on one side of the unit, and exhaust is discharged outward through the opposite side screened opening.

POWER CONNECTION

C A U T I O N

Never exceed the rated voltage as this will cause the Load Bank to overheat.

Failure to connect the power supply under test to the correct polarity on the Load Bank may result in damage to the Load Bank. Refer to the Safety Considerations section of this manual.

Control and fan power requirements are 24 VDC at approximately 1.8 Amps. This power is derived from the input power terminals.

To connect load power, attach load cables to the input power terminals on the front of the Load Bank. The terminals are labeled 48 Volts (+), 24 Volts (+), NEG (-), and GND. The NEG (-) terminal is common to both voltages. Use the terminals that match the voltage application to be tested.

C A U T I O N

Fans and controls derive power from the Load Bus. Therefore, never apply voltages less than 10% of the rated Load Bank voltage. This condition must be followed to prevent Load Bank damage.

SECTION III

INSTALLATION

BEFORE INSTALLATION

Inspect the Load Bank for obvious damage such as broken wires, broken or dented panels, cracked ceramic insulators, or any other component breakage that may have occurred in shipment.

LOCATION

The K492 is a portable, indoor Load Bank, and should be installed in a cool, well-ventilated area. Cool air must be continually available so the hot exhaust air can be dissipated and not recirculated through the unit. Install such that the inlet and exhaust panels have unrestricted airflow clearance.

C A U T I O N

Installation must prevent hot exhaust air from recirculating into the air intake. Inlet air temperatures exceeding 104°F may cause damage to the Load Bank. After installation, test the unit at full load and verify that the inlet air temperature does not exceed 104°F.

AIRFLOW CONSIDERATIONS

Even with an ample supply of cooling air, the Load Bank may overheat if it is not properly installed. There are two types of airflow problems that should be avoided:

1. Recirculating Airflow - If the hot, exhausted air is permitted to recirculate through the Load Bank, it will reach such a high temperature and low density that it will no longer cool the resistance elements. A Load Bank should not be installed

so close to any surface as to reflect the exhausted air back to the air intake. When two or more Load Banks are being used, care must be taken in positioning the Load Banks so that the exhausted air of one unit does not feed the air intake of another.

2. Restriction of Cooling Air - Any obstruction located within two (2) feet of the inlet and exhaust screens will restrict the Load Bank's airflow. Airflow is also restricted when two or more Load Banks have air inlets positioned close to each other. This competition for cooling air causes a low pressure area, restricting adequate airflow.

W A R N I N G

It is vitally important to install the Load Bank properly. Installation errors may result in a catastrophic failure. The temperature switches, and protective devices in the Load Bank, will guard against some of these problems. If protective circuitry prevents application of the load, determine the source of the problem. **DO NOT DISABLE the TEMPERATURE SWITCHES.** This causes a safety hazard and voids the warranty. The following installation instructions are critical to the safe operation of the Load Bank. Refer to the Safety Considerations section of this manual.

POWER REQUIREMENTS

The Load Bank derives its control/fan power from the power supply under test. Therefore, connection of power cables in the 24 or 48 Volt mode is required prior to operating the Load Bank. Control and fan power is derived at 24 VDC, approximately 1.8 A for either the 24 or 48 volt connection.

The power supply under test load connections are at the twist-on terminals mounted on the control panel. The terminals are identified as 48 Volts (+), 24 Volts (+), and NEG (-). Cables are to be connected to the respective load terminals as required for the voltage rating of the supply to be tested. The NEG (-) terminal is common to both voltages.



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C A U T I O N

The Load Bank is not internally protected from short circuit faults or overcurrent applications. Therefore, it is recommended that the power supply being tested contain a fuse or that an external fuse be added between the power supply and the Load Bank input terminals.

Cables to the Load Bank should be of adequate size to handle maximum rated load according to the National Electrical Code and any local codes.

A case ground terminal is provided on the lower right side of the control panel and must be connected to the supply under test frame, which in turn should be connected to a good earth ground.

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SECTION IV

OPERATION

PURPOSE AND USE OF CONTROLS

1. MASTER LOAD ON/OFF switch - This switch turns on the cooling fans and powers the remainder of the control circuit.
2. OVER TEMPERATURE lamp - This lamp should momentarily light when MASTER LOAD switch is turned on. This shows the air safety circuit is working. The purpose of the OVER TEMPERATURE lamp is to warn the operator and remove the load to the Load Bank in case of improper cooling of the load elements. (This light also illuminates if reverse polarity is connected to input terminals.)
3. Load step ON/OFF switches - Allow load steps to be applied or removed at the rating identified under each switch.

LOAD BANK OPERATION

All tests start with control panel switches in the "OFF" position.

C A U T I O N

Before energizing any load, verify that load voltage does not exceed rated voltage of Load Bank.

The unit is energized by the MASTER LOAD ON switch. This switch also energizes the cooling fans. Upon energizing the unit, the red OVER TEMPERATURE lamp will light momentarily until the enclosed temperature switches signal that safe operating temperature is present, at which time the light goes off. At this point, activating the appropriate load switches will apply the load to the power supply under test.

If the operating temperature in the Load Bank reaches an unsafe level, the temperature switches disconnect the load and the red OVER TEMPERATURE lamp will light.

C A U T I O N

Do not attempt operation if the fans are not running. Fan inlet and exhaust must be unrestricted. The operation of the fan is vital to the safe operation of this Load Bank. If the OVER TEMPERATURE indicator light comes on and stays on for more than a few seconds without the load dropping out, shut off the MASTER LOAD switch at once. Remove all power to the unit and check for proper operation of the fan safety circuit. Failure to correct an over temperature condition will result in the destruction of the Load Bank. Refer to the Safety Considerations section of this manual.

OPERATING INSTRUCTIONS

C A U T I O N

Never exceed the rated voltage as this will cause the Load Bank to overheat.

Failure to connect the generator to the correct polarity on the Load Bank may result in damage to the Load Bank. Refer to the Safety Considerations section of this manual.

1. With all control panel switches in the OFF position, connect the appropriate power supply leads to the Load Bank.

2. Connect #8 AWG, minimum, wire from Load Bank ground terminal to power supply under test frame.
3. Connect power supply under test frame to a good earth ground.
4. Activate power supply under test.
5. Move the MASTER/LOAD switch to the ON position. Verify that the red OVER TEMPERATURE lamp momentarily lights and then goes off.
6. Activate the desired load using control panel load switches.
7. After running tests, remove the load by moving all load step switches to the OFF position. Accumulated heat may be removed from the Load Bank by allowing the cooling fans to operate for a few minutes with all loads removed. This procedure is not required for Load Bank integrity, but it may guard operating personnel from possible burn injuries.

W A R N I N G

DO NOT touch the exhaust screen during, and for some time after operation. The screen will become hot from the exhausted heat and may cause a serious burn. Refer to the Safety Considerations section of this manual.

DO NOT allow objects to enter or block screens.

8. Move the MASTER LOAD switch to the OFF position.
9. Turn OFF the power supply under test and disconnect all leads from the Load Bank.



ESD PRECAUTIONARY GUIDELINES

C A U T I O N

Certain circuit card assemblies and their components, typically integrated circuits, may be damaged by seemingly undetectable electrostatic discharge (ESD). Care must be exercised during handling/repair of these items. Use electrostatic discharge precautionary procedures.

The following guidelines are not necessarily all inclusive but rather serve as reminders for good shop practices for the handling/repair of ESD sensitive circuit card assemblies and devices.

- Store ESD sensitive items in their original containers. These items are often marked with the symbol shown at the top of this page.
- Put on a grounded wrist strap before handling any ESD sensitive item.
- Clear work area of Styrofoam^R*, plastic, and vinyl items such as coffee cups.
- Handle ESD items by the body, never the open edge connectors.
- Never slide ESD sensitive items over any surface.
- Transport ESD sensitive items in a static shielding container to a static-free work station.
- If a static-free work station is not available, ground the transport container before removing or inserting an ESD item.
- Electric tools used during repair should be grounded. For example, use only anti-static type solder suckers and grounded tip soldering irons. Discharge non-electric tools before use.
- Pack ESD items in static shielding containers before shipping them to Avtron for repair.

*Styrofoam^R is a registered trademark of Dow Chemical.

SECTION V

MAINTENANCE

To provide long equipment life and to reduce the chance of electric shock, fires, and personal injury, good maintenance procedures must be used. Before servicing, review the Safety Considerations section of this manual.

The following examples of scheduled maintenance procedures are not intended to be all-inclusive, but must be accomplished to maintain the equipment in a good, safe condition. All maintenance work must be done only by qualified personnel.

W A R N I N G

Personal injury from electrical shock or from the moving fan blades may result if power is not disconnected from the Load Bank prior to performing maintenance procedures. Refer to the Safety Considerations section of this manual.

DAILY

1. Remove any restrictions to airflow through the Load Bank.
2. Check the screens to make sure that no objects have blocked or entered the openings.
3. Verify that the airflow is in the proper direction.
4. Assure that there is no recirculation of the exhaust air through the Load Bank.

THREE MONTHS OR 500 HOURS

1. Remove access panels and screens.
2. Inspect the load resistors for mechanical breakdown which is demonstrated by excessive sagging of the elements. Replace with new resistor elements as required.
3. Inspect for loose hardware or loose connections. Tighten where required.
4. Inspect all connections for oxidation or corrosion. Clean the connection or replace the hardware where required.
5. Inspect magnetic contactor to make sure that the contacts are not severely pitted or corroded. The contacts must move freely and be properly seated.
6. Clean all dirt and debris out of the Load Bank. This can be accomplished by blowing the inside of the unit with clean, dry compressed air (not to exceed 40 PSI). Eye protection should be worn when cleaning the Load Bank with compressed air.
7. Inspect all the wiring for any sign of insulation failure.
8. Replace all access panels and screens. Tighten all the fastening hardware securely.
9. Check the indicator lamp on the control panel.

PARTS REPLACEMENT

Access to any component is easily made with the removal of the cover panels. Major components in the unit are listed in the replacement parts list. Avtron maintains an inventory of normally used items.

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SCHMATIC REFERENCE	DESCRIPTION	MANUFACTURER and PART NO.	AVTRON P/N	QTY/UNIT
	AVTRON MODEL K492 LOAD BANK		K492- D22642 B21720	REF
	.Schematic/Interconnection, Load Bank (150 Amps)			
	.Bus Link		602709	6
	.Bus Link		602710	26
	.Resistance Element		605777	8
	.Resistance Element		605778	2
	.Resistance Element		605779	28
M2	.Ammeter	Crompton Instr. 223-01-AA-GBRL	337542	1
M1	.Voltmeter	Crompton Instr. 223-01-VA-HWHW	337543	1
R10	.Shunt, Instrument	Empro Elec. MLB-200-100	337995	1
B1-4	.Fan	Indek Corp. HDF-1225L- 24HNB	322133	4
	.Fan Guard	FAN-S 08129	322044	4
E1-4	.Terminal, Stud	Underwriter's Safety C1938	366813	4
S1-12,15	.Switch, Toggle	Cutler-Hammer 7630K36	363014	13
K1	.Relay, Armature	Albright Eng. Ltd. SW180A-24DC-CW	351873	1
S13,14	.Switch, Thermostatic	Selco Products SO-180	360877	2
DS1	.Light, Indicator	Imlec F151-24R	329662	1
R3	.Resistor, Fixed 6 Ohm, 50W, $\pm 1\%$	Dale Electron. RH50	148023	1
	.Knob, Threaded	Per Desc. Jergens Inc. 32206	453364	4
TB1,2	.Terminal Board	Keystone Elec. 818	364585	2
CR1,2	.Semiconductor Device	Texas Instrmts. 1N4003	354585	2
R4	.Resistor, Fixed 7 Ohm, 50W, $\pm 1\%$	Dale Electron. RH50 Per Descr.	148024	1



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SCHEMATIC REFERENCE	DESCRIPTION	MANUFACTURER and PART NO.	AVTRON P/N	QTY/UNIT
C1	.Capacitor, 1000uF, 50V	Illinois Capacitor 108RMR050M	221549	1
R5	.Resistor, 2.5 Ohm, 50W		148022	1
R6	.Resistor, 560 Ohm, 1W		110123	1

APPENDIX

LOAD BANK TROUBLESHOOTING GUIDE

NOTE

Servicing should always be done only by trained, qualified service technicians.

W A R N I N G

Be sure that all sources of power to the Load Bank are disconnected before servicing.

PROBLEM	POSSIBLE CAUSES/REMEDIES
1. Load Bank main power fails to come on.	a. Main switch or circuit breaker is not closed. b. Unit is not connected according to the Schematic/Interconnection Diagram. c. Terminals were damaged during shipment. d. Fuses are blown. (Check and replace as required.)* e. Fuse is blown in Load Bank control circuit. (Check and replace as required.)* f. Dirty or loose connection at Main Power Switch.
2. Blower motor does not operate.	a. Main switch or circuit breaker is not closed. b. Power is not connected to Load Bank blower circuit. c. External power source is inadequate. d. Motor fuses are blown. (Check and replace as required.)*

* When checking fuses for continuity, be sure to remove all fuses from clips (in fuseblock or Disconnect Switch). Test each fuse individually, out of circuit. (If tested in circuit, there is the possibility of feedback which causes false readings. A blown fuse may still check out OK.)

PROBLEM	POSSIBLE CAUSES/REMEDIES
2. Blower motor does not operate. (Cont.)	<ul style="list-style-type: none"> e. Motor overload is tripped. f. Motor start is malfunctioning. g. Main Power Switch is inoperative. h. Connections are broken or loose. i. Motor shaft does not turn due to improper lubrication. (Replace or repair as necessary.)
3. BLOWER FAILURE indicator lights, yet blower is operating.	<ul style="list-style-type: none"> a. Airflow restrictions present at Load Bank intake or exhaust. b. Improper fan blade rotation or phase reversal. (Check fan motor power connections for proper phase sequence.) c. Air Differential Pressure Switch is malfunctioning. d. Blower Fail Relay is malfunctioning.
4. Fan blade is broken or not turning.	<ul style="list-style-type: none"> a. Fan blade motion is obstructed. b. Fan blade is loose at hub or is not keyed properly.
5. Load step(s) cannot be energized.	<ul style="list-style-type: none"> a. A blower failure exists. (See problem 2.) b. MASTER LOAD Switch is inoperative. c. Control power is inadequate. d. Fuse is blown in Load Bank control circuit or individual branch circuit load fuse (if so equipped) is blown. (Check and replace as required.)* e. Blower Fail Relay is malfunctioning. f. Load step switch is inoperative. g. Load step contactor is inoperative. h. Magnetic contactor has an open coil. i. Load step resistor is open.

* When checking fuses for continuity, be sure to remove all fuses from clips (in fuseblock or Disconnect Switch). Test each fuse individually, out of circuit. (If tested in circuit, there is the possibility of feedback which causes false readings. A blown fuse may still check out OK.)

PROBLEM	POSSIBLE CAUSES/REMEDIES
6. Contactor "chattering" exists.	<ul style="list-style-type: none"> a. Contacts and/or core are dirty or corroded. b. Connections to contactor coil are loose. c. Control circuit line voltage is too low.
7. Load Bank or load step does not give rated load.	<ul style="list-style-type: none"> a. Applied load voltage is either derated or inadequate. b. Contactor does not close properly. c. Load step resistor element is open. d. One of the individual load branch circuit fuses is blown (if so equipped).
8. Disconnect Switch fuses are blown.	<ul style="list-style-type: none"> a. Fuses are undersized.* b. A short circuit exists in the blower or control circuit.*

* When checking fuses for continuity, be sure to remove all fuses from clips (in fuseblock or Disconnect Switch). Test each fuse individually, out of circuit. (If tested in circuit, there is the possibility of feedback which causes false readings. A blown fuse may still check out OK.)

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